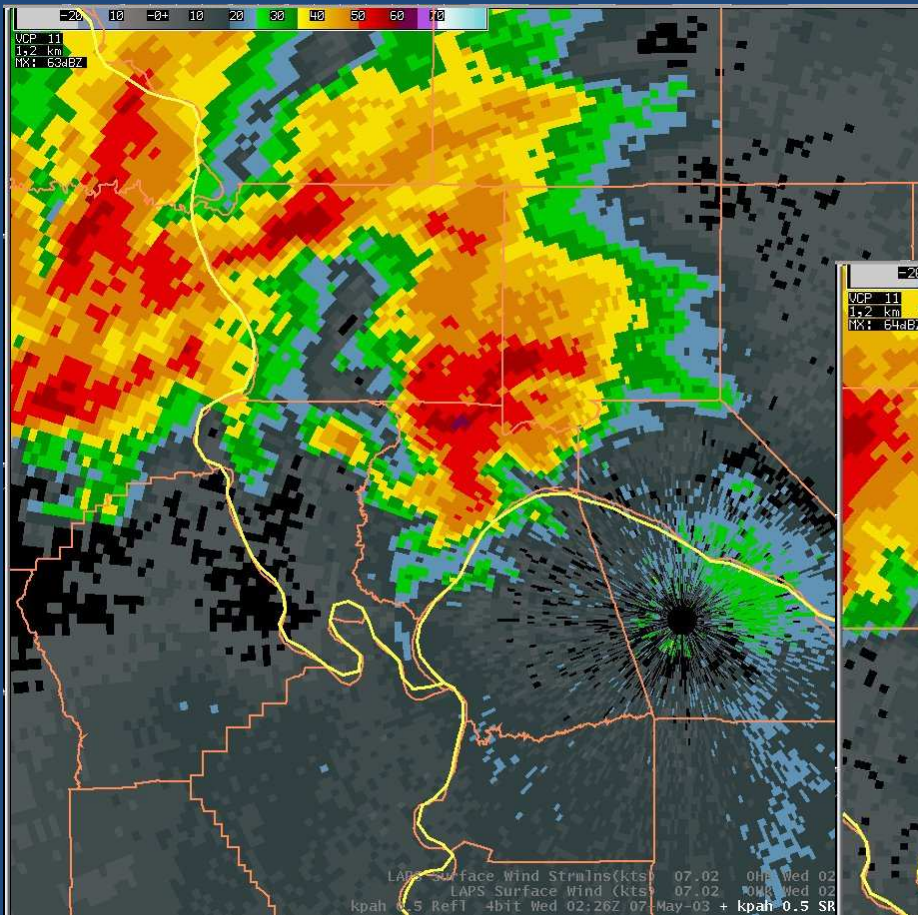
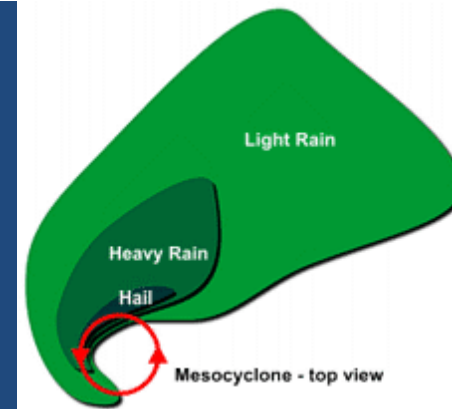
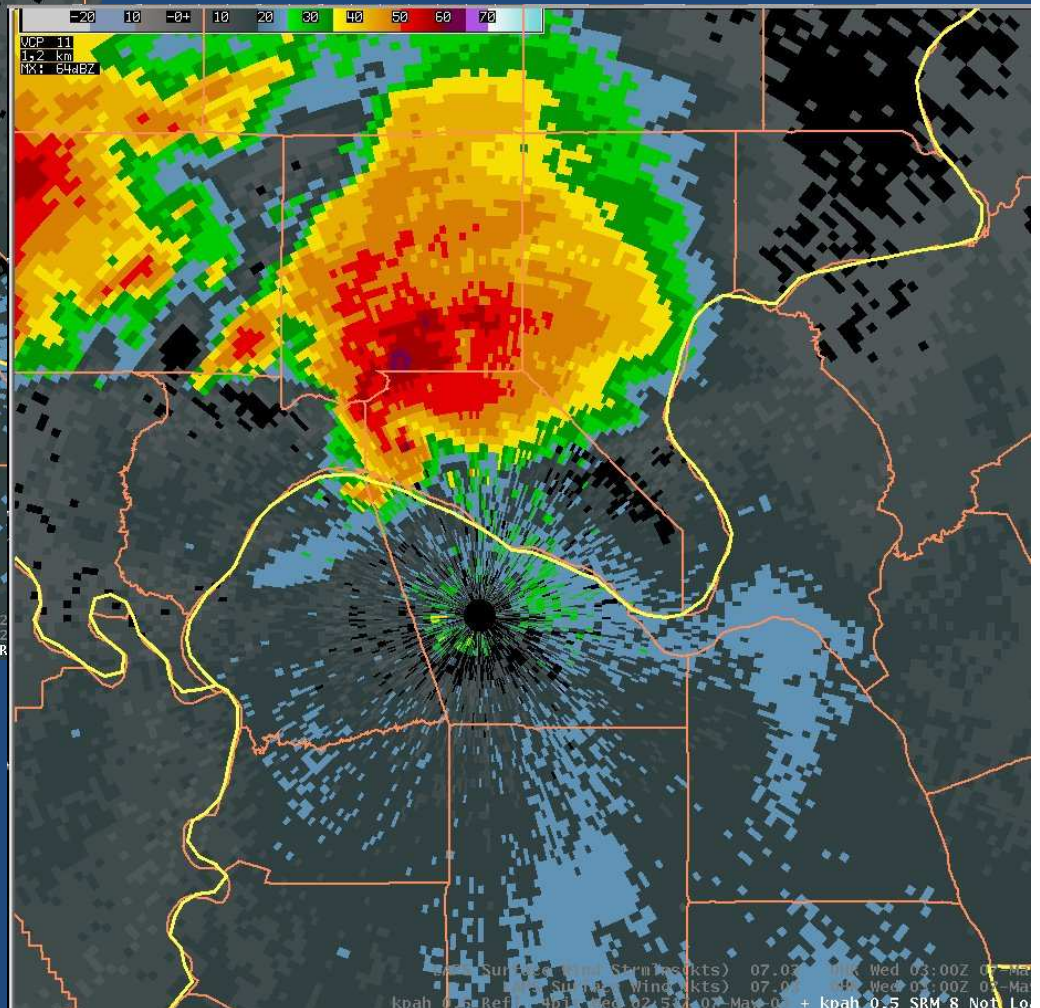


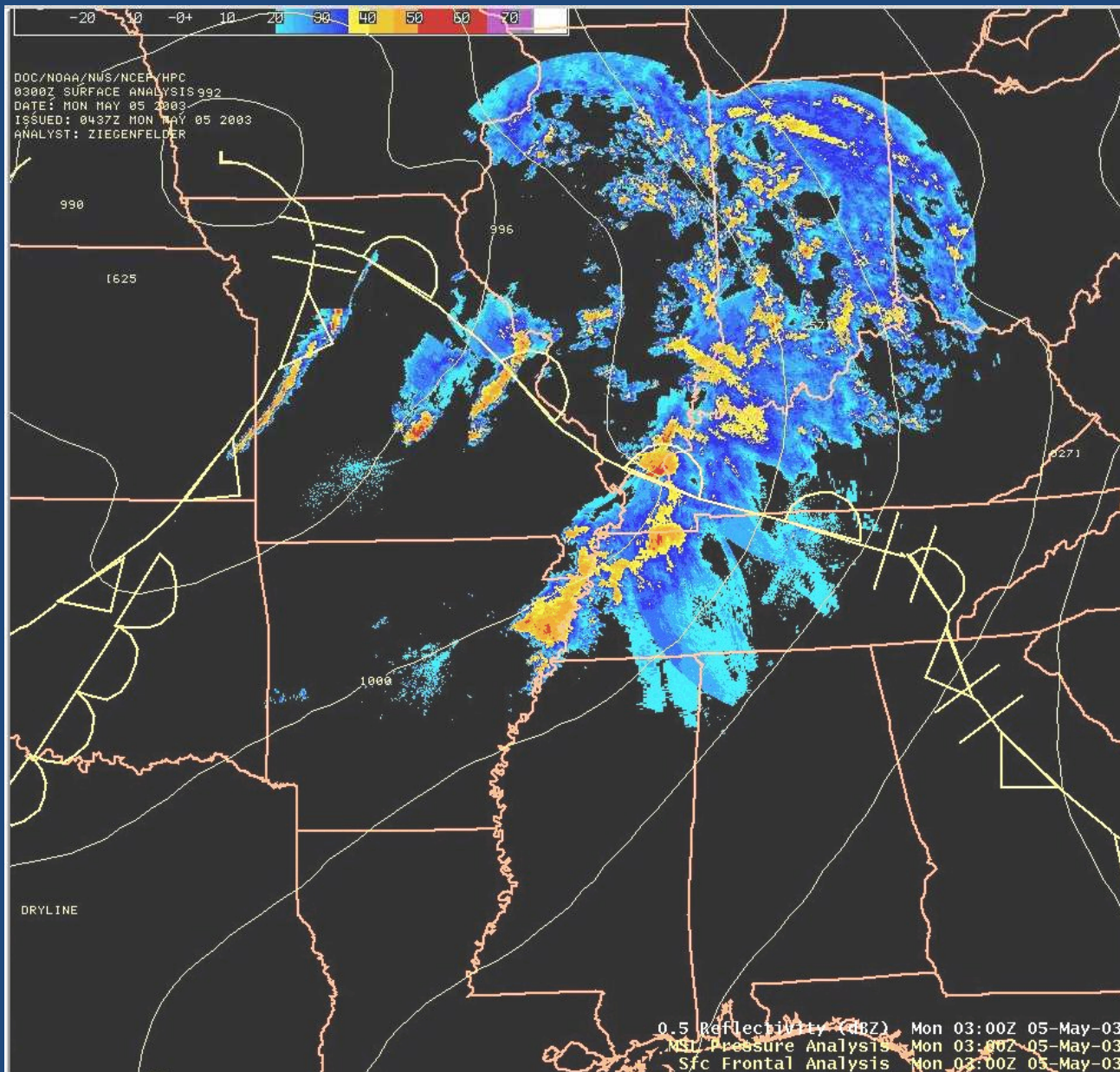
Supercells



Not all have classic hooks



May 4, 2003

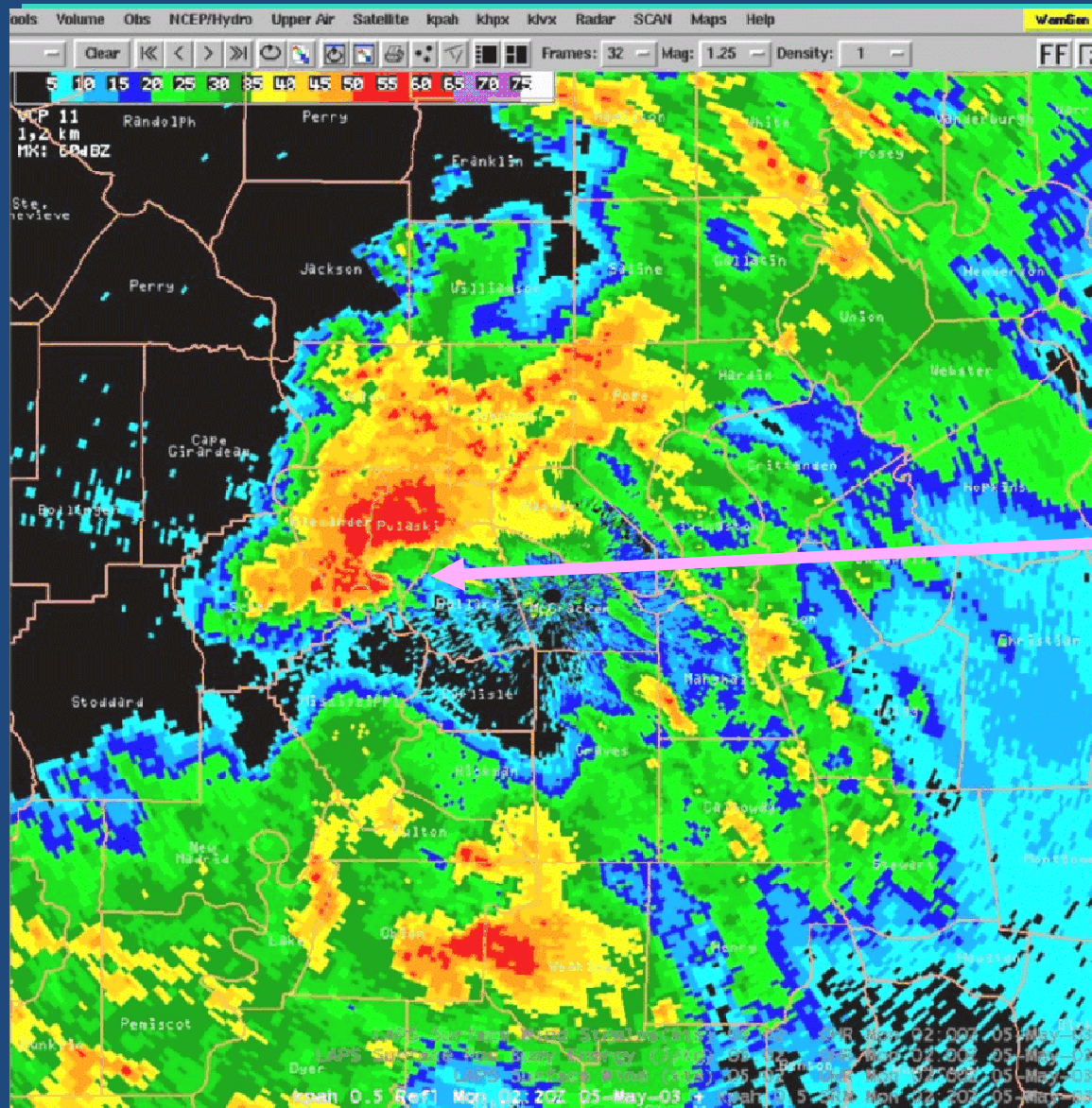


This image is from 10 PM.

Note the storm just north of the warm front in southern Illinois. This storm is tornadic (likely with the help of the energy supplied by the warm front).

The storm along the Kentucky/Tennessee border will also soon produce a tornado in Calloway county. No boundary could be found in that area.

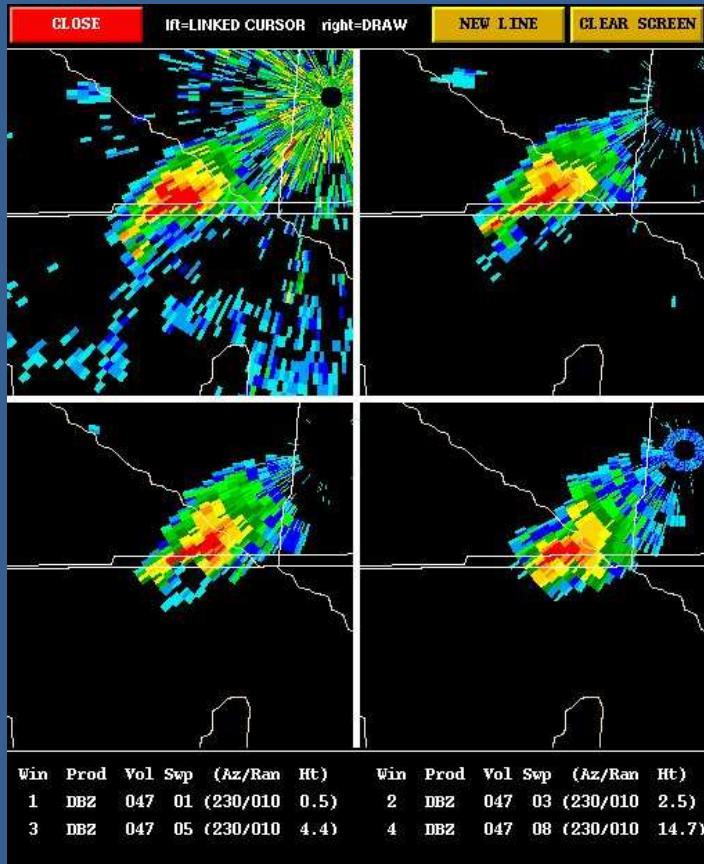
May 4, 2003



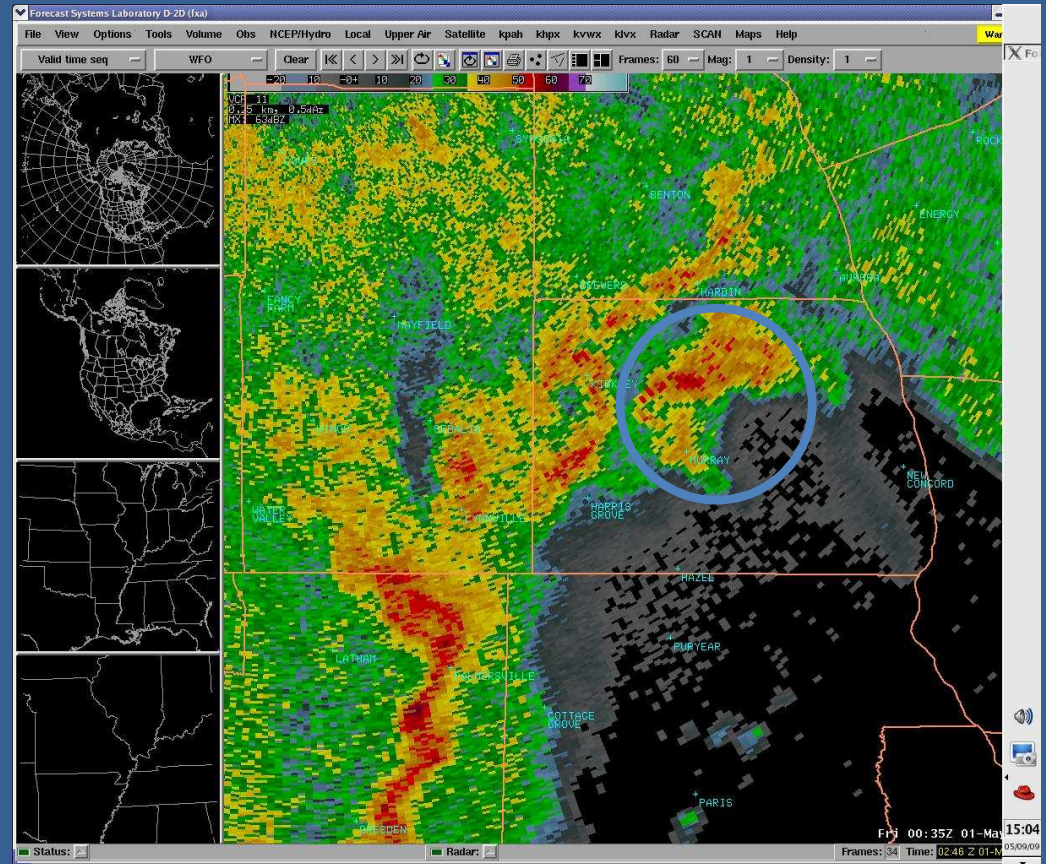
Note supercell crossing Mississippi River.

There is a large inflow notch on the south side of the storm. This storm has already produced at least 1 tornado and will produce more as it moves east.

Mini-Supercells



June 17, 1997

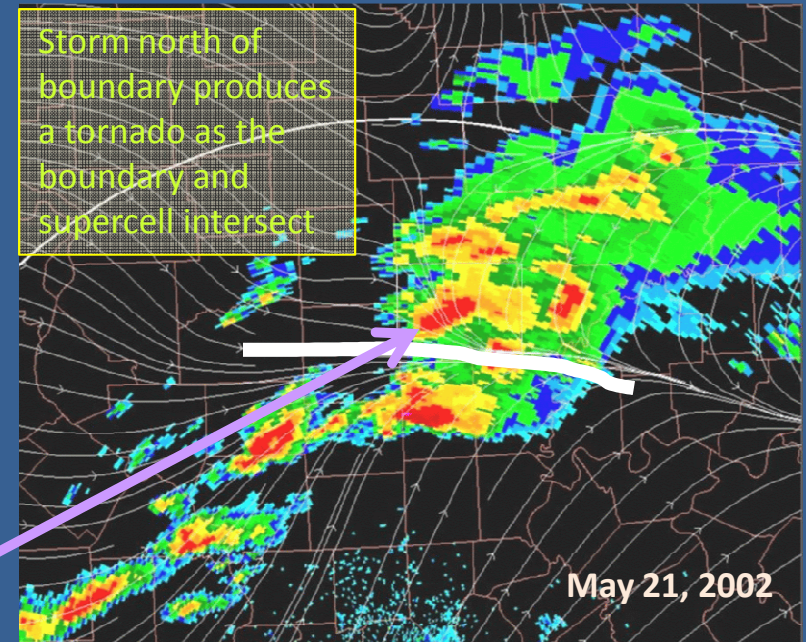
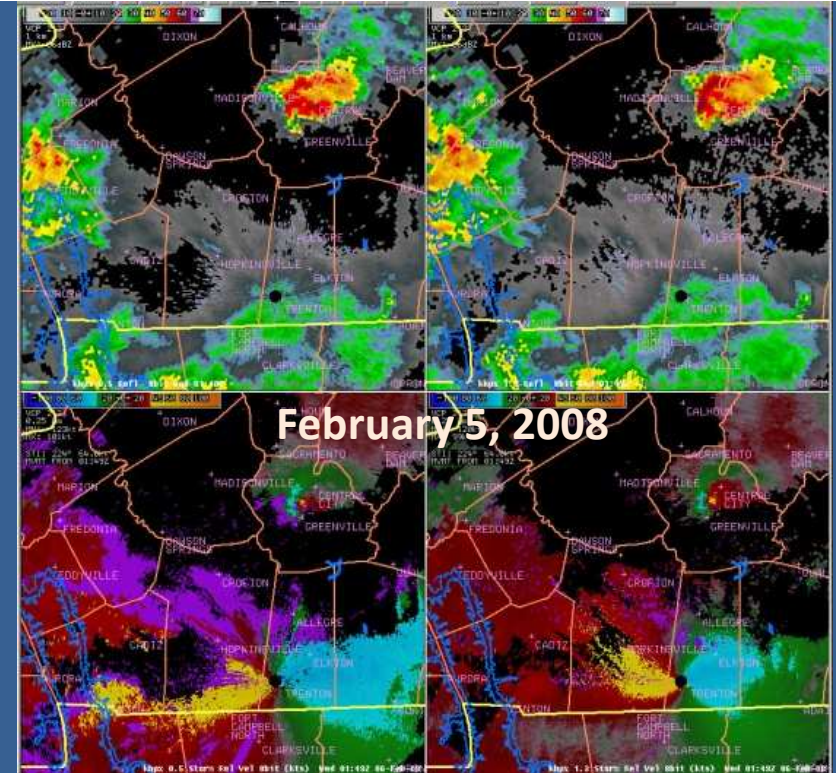


May 1, 2009

Mini-supercells are just that. These storms produce tornadoes, but have weaker rotation and can be 75% smaller than a typical supercell. Sometimes, they do not even have lightning.

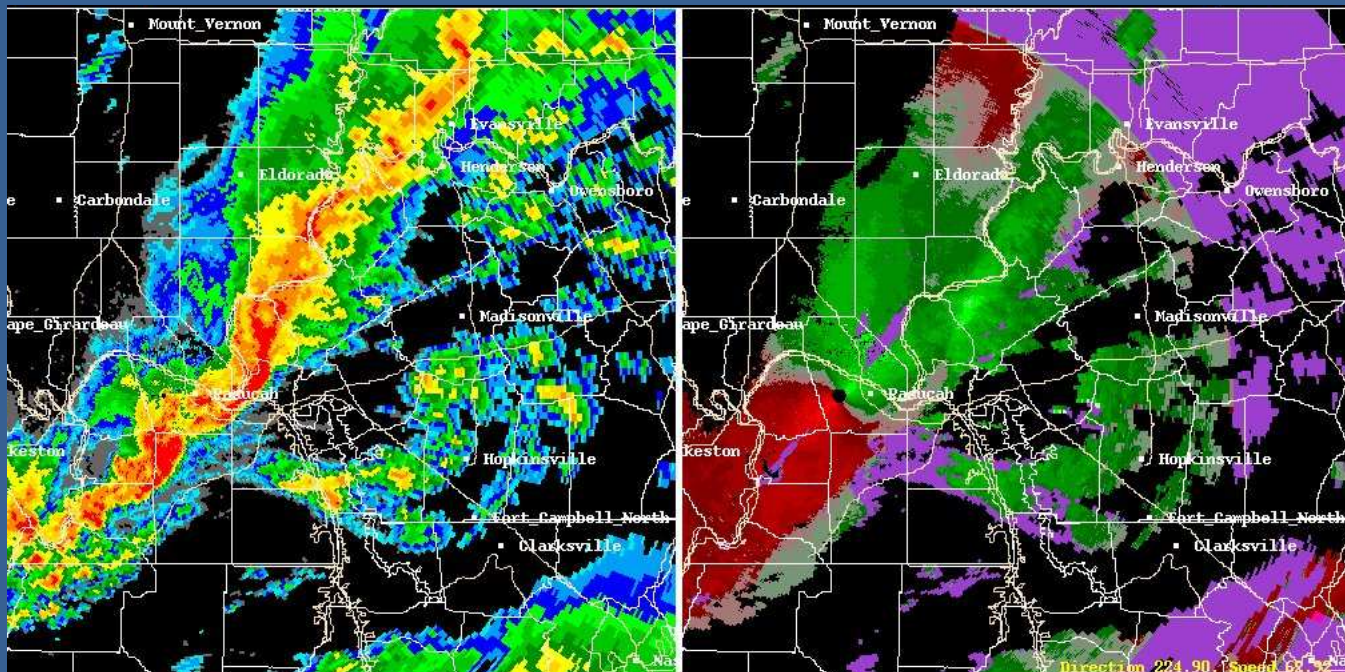
Tornadoes in a Single Cell

- On rare occasions, the atmosphere can readily supply the energy a storm needs to produce a tornado.
- On many occasions, though, a boundary is needed to supply the extra energy to produce a tornado.
- That said, just because a storm passes over or is along a boundary, does not mean it will produce a tornado

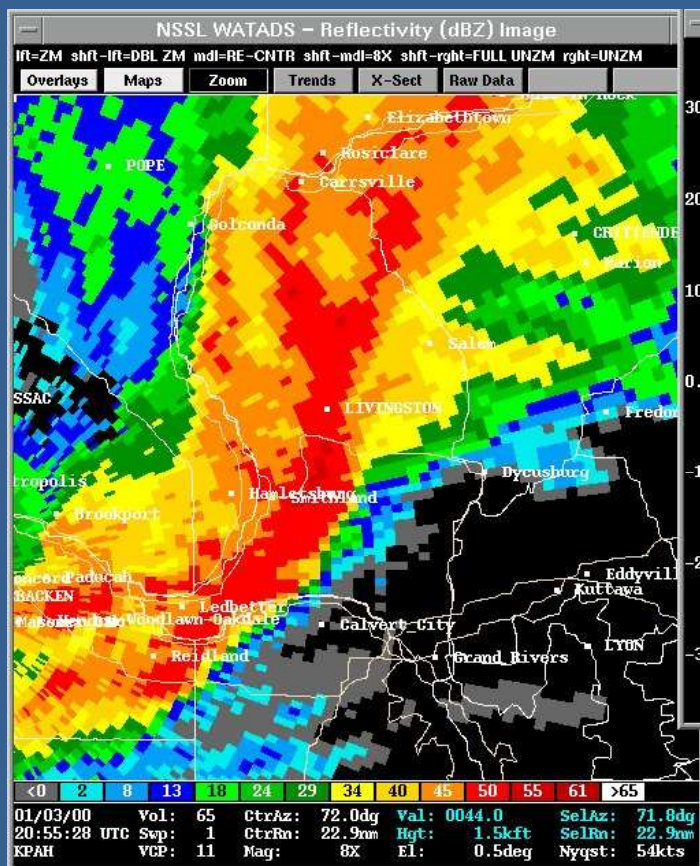


Tornadoes in Lines

- May be embedded supercells or a linear structure that encounters the tornadic environment.
- These are generally much more difficult to spot in the field, and can be more difficult to see on the radar



Tornadoes in Lines



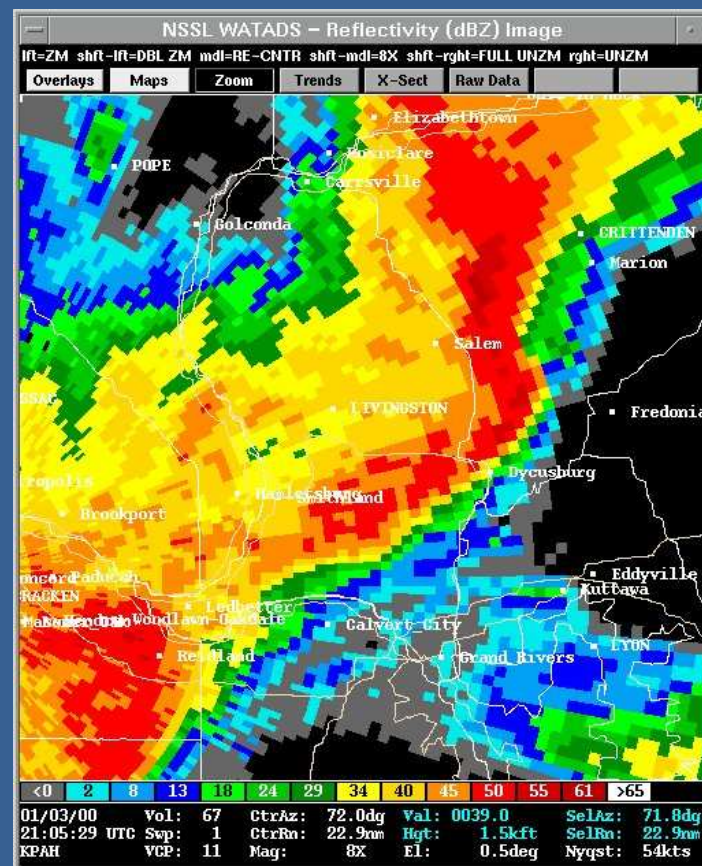
Storms were moving NE at 60 mph

This line went on to produce an F3

There is 10 minutes between the image on the left and the image on the right.

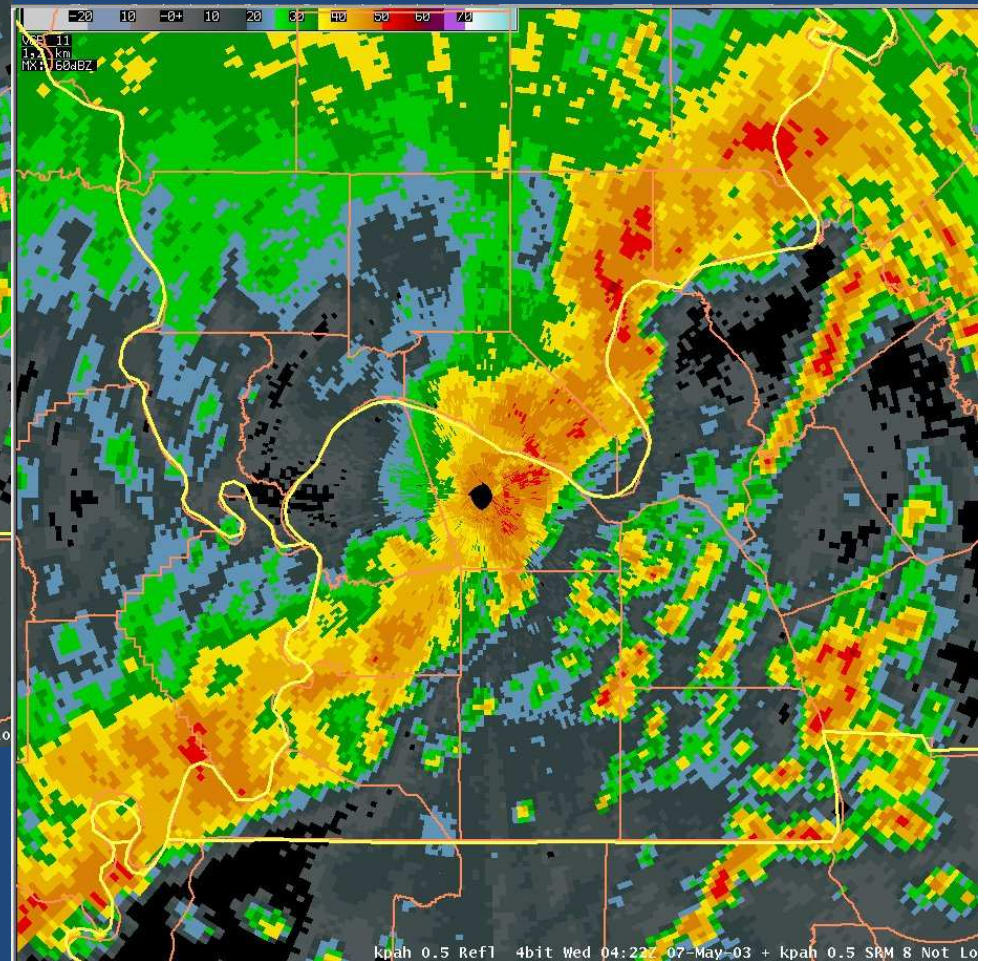
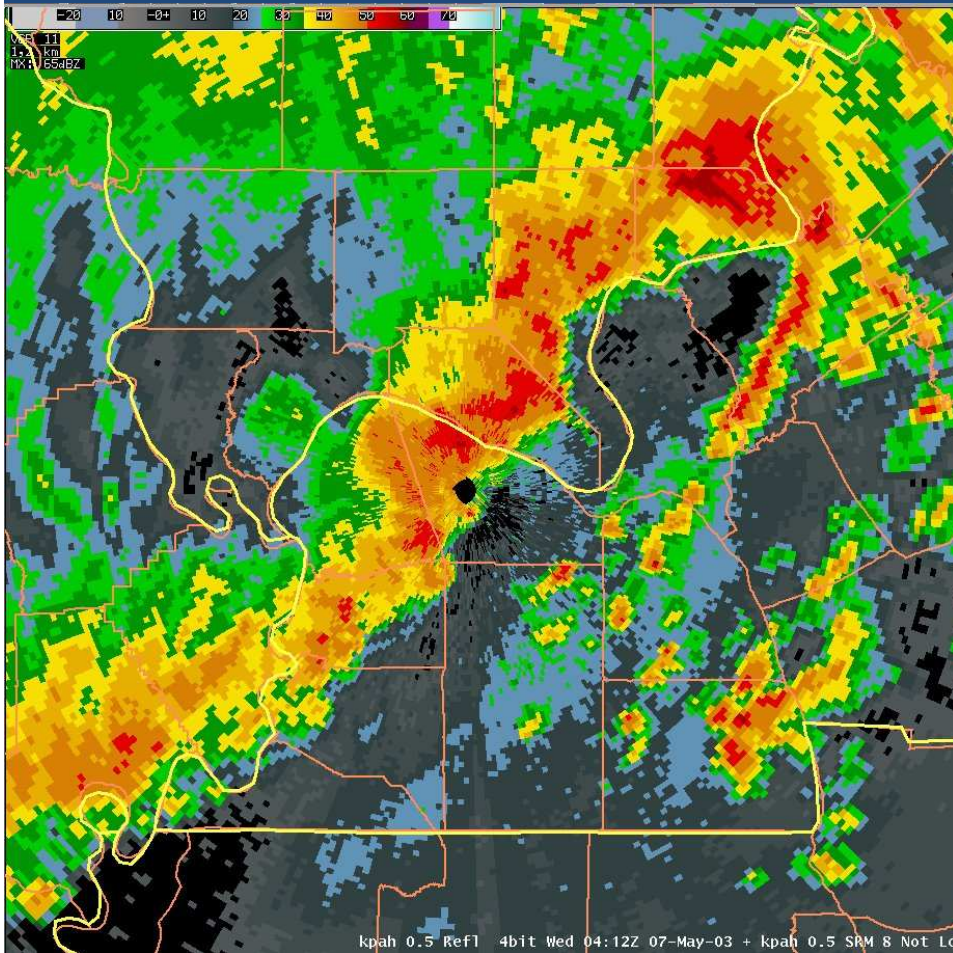
Notice how the image on the right has more of a bow shape.

The tornado formed just north of the apex or the point of the bow

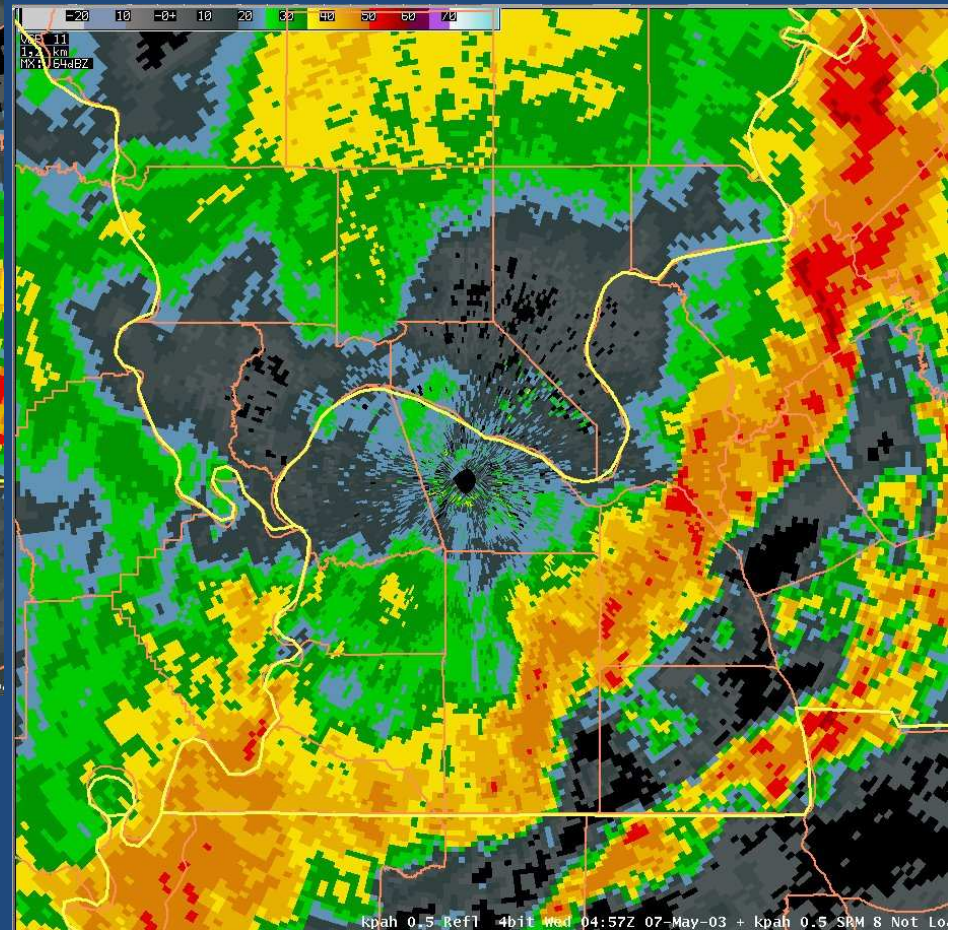
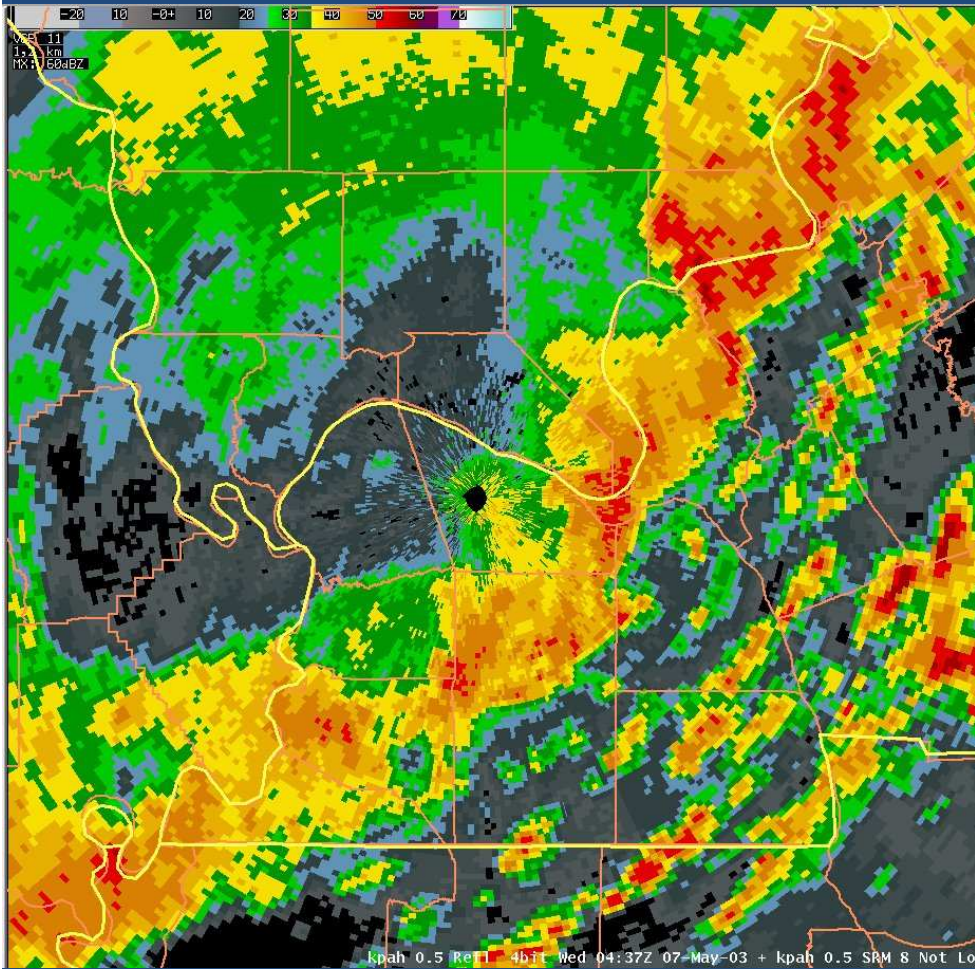


This portion of the line, however, moved almost due east at 60 mph

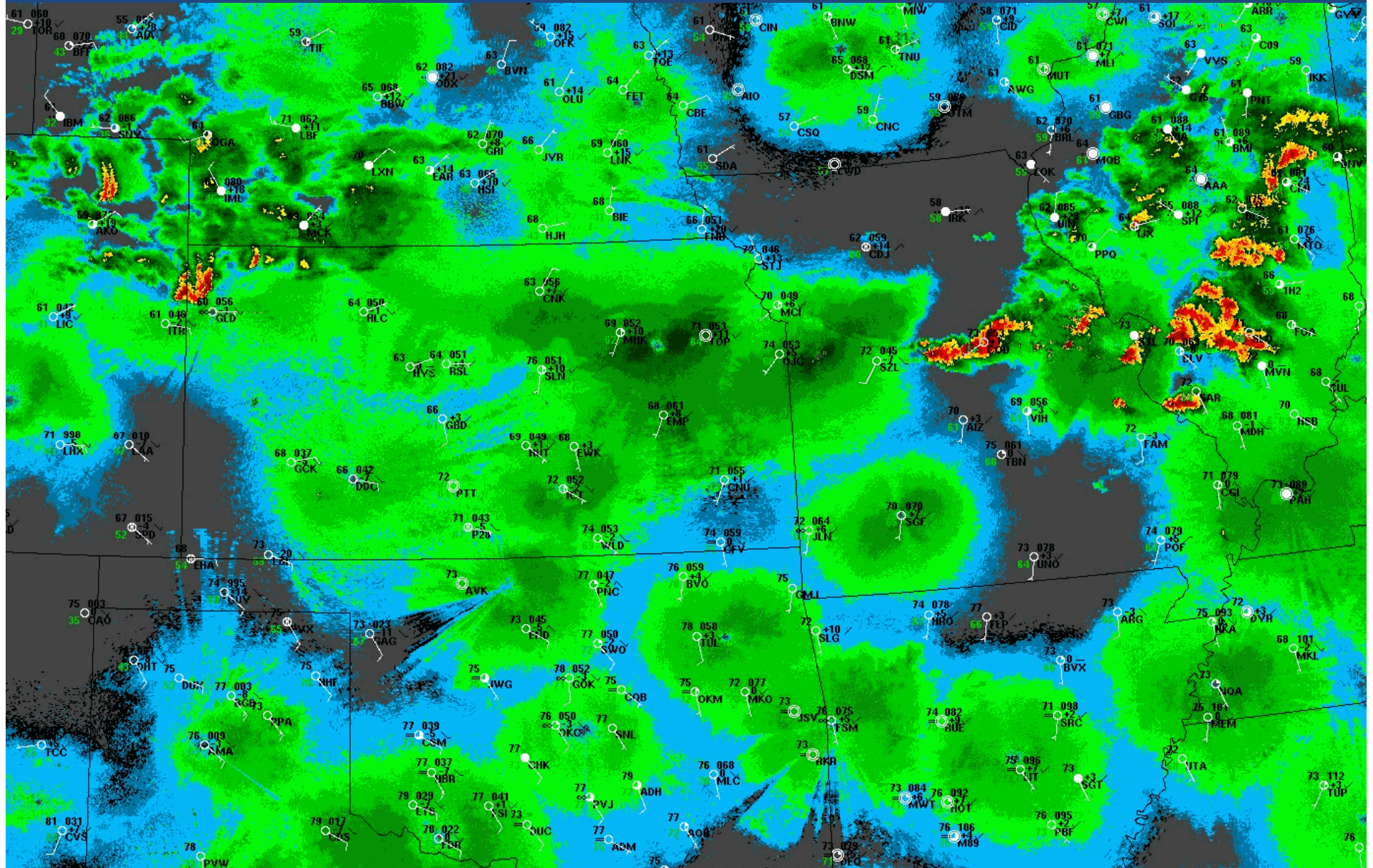
Tornadoes in Lines



Tornadoes in Lines



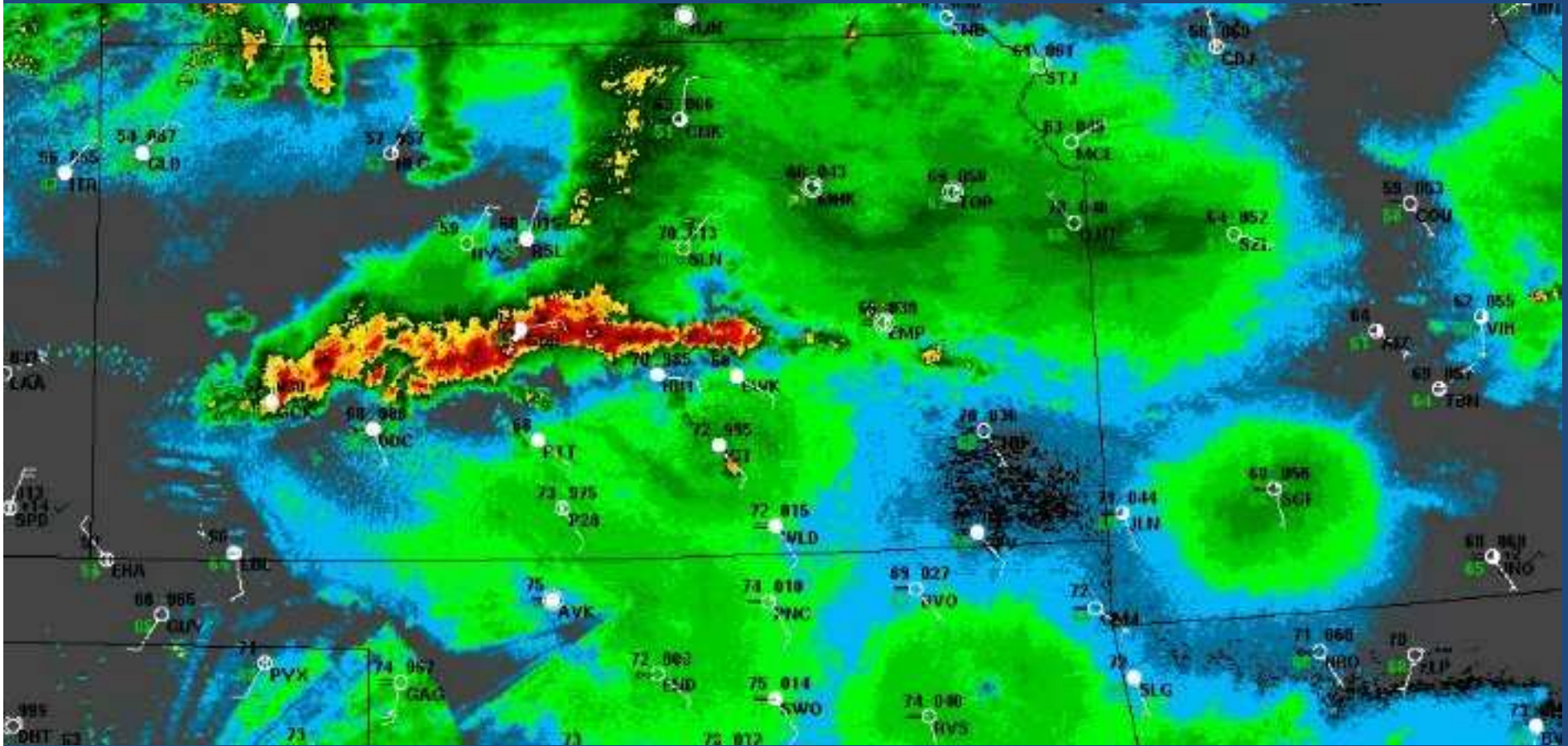
Derecho



METAR 090508/0300 SKYC THPF WSYM SMSL PTND DWPF STID BRBK
090508/0410 RADAR NOR

Courtesy WDTB

How it starts



- Individual storms merge and organize

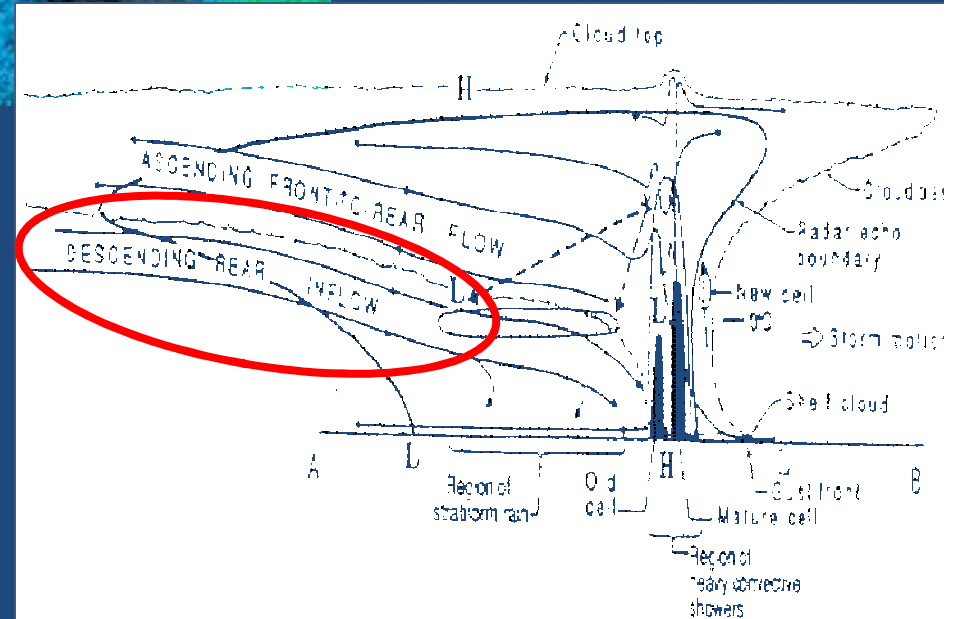


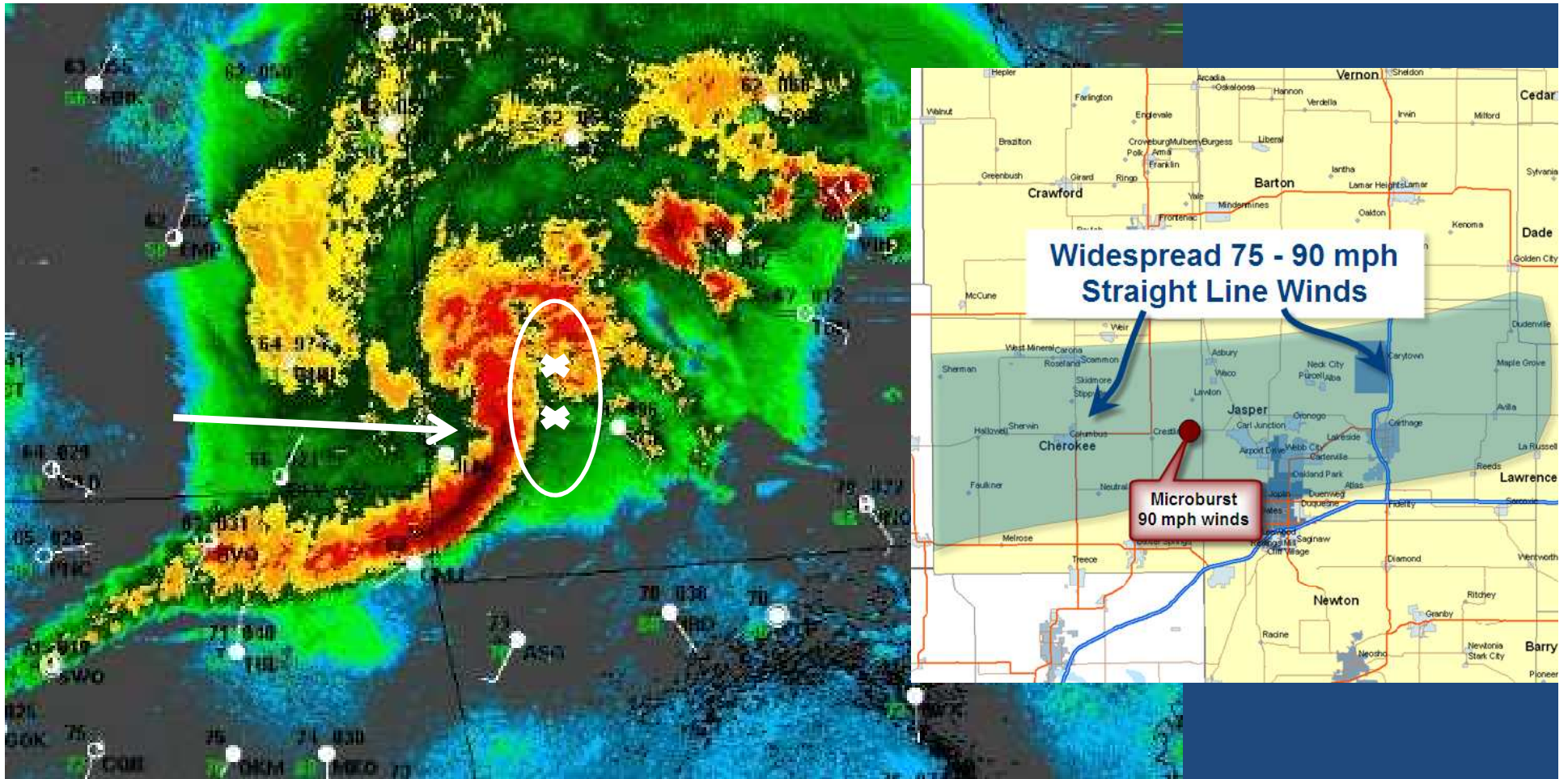
After a period of time, the Coriolis Force (created by the rotation of the earth) aids in the development of a dominant circulation (vortex)



Vortex acts to focus the rear inflow jet

- Rear Inflow Jet descends to the ground
- This Jet forces the acceleration of a portion of the line into a bow

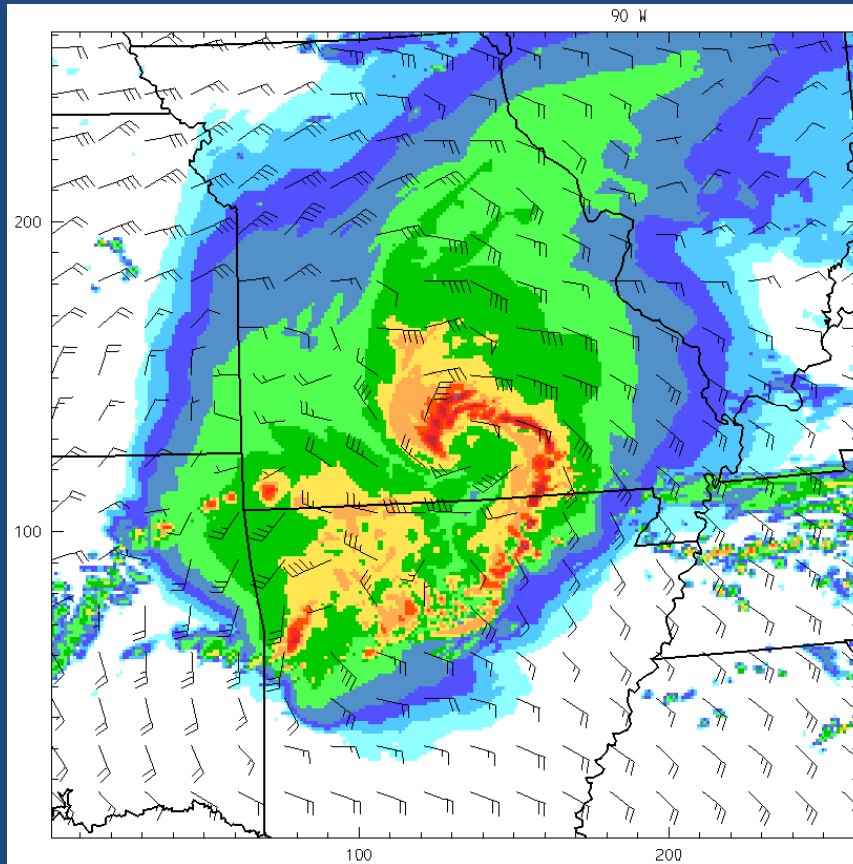




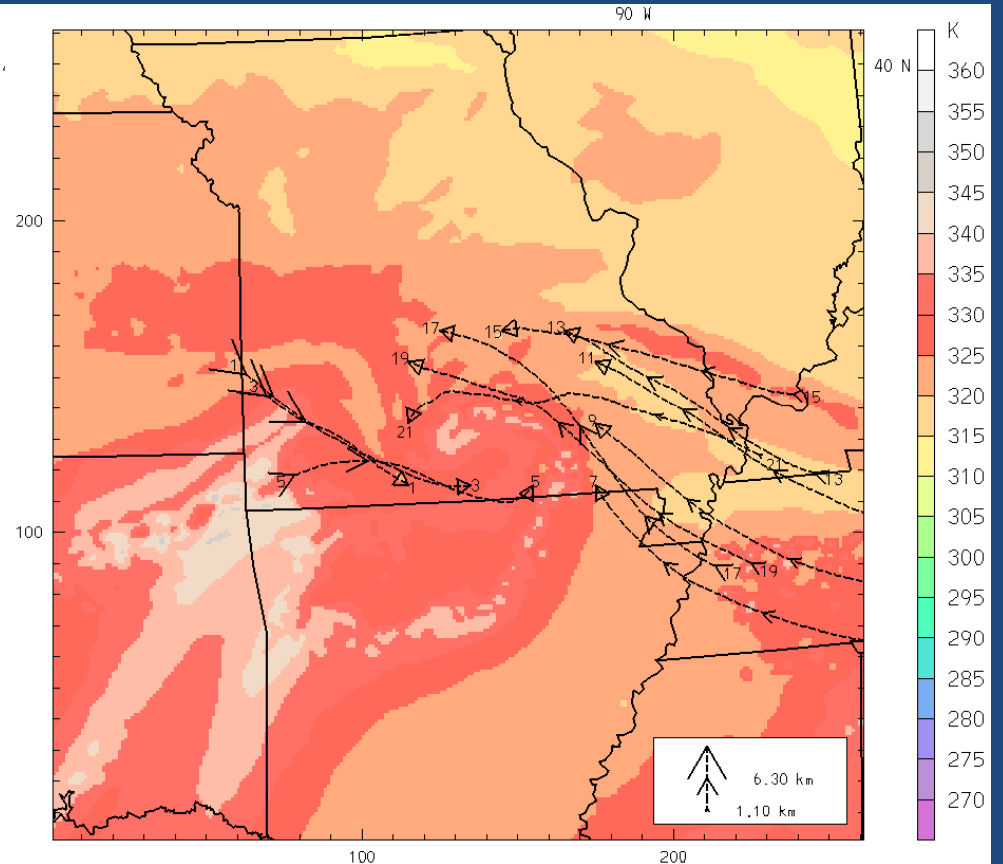
- Rear inflow jet continues and produces damaging winds on the ground especially near the apex (point) of the bow echo

Once the rear inflow jet develops, there may be smaller circulations on the leading edge, which can be tornadic or locally enhance the damaging wind

9 AM Model Forecast/Analysis



Model forecast of radar



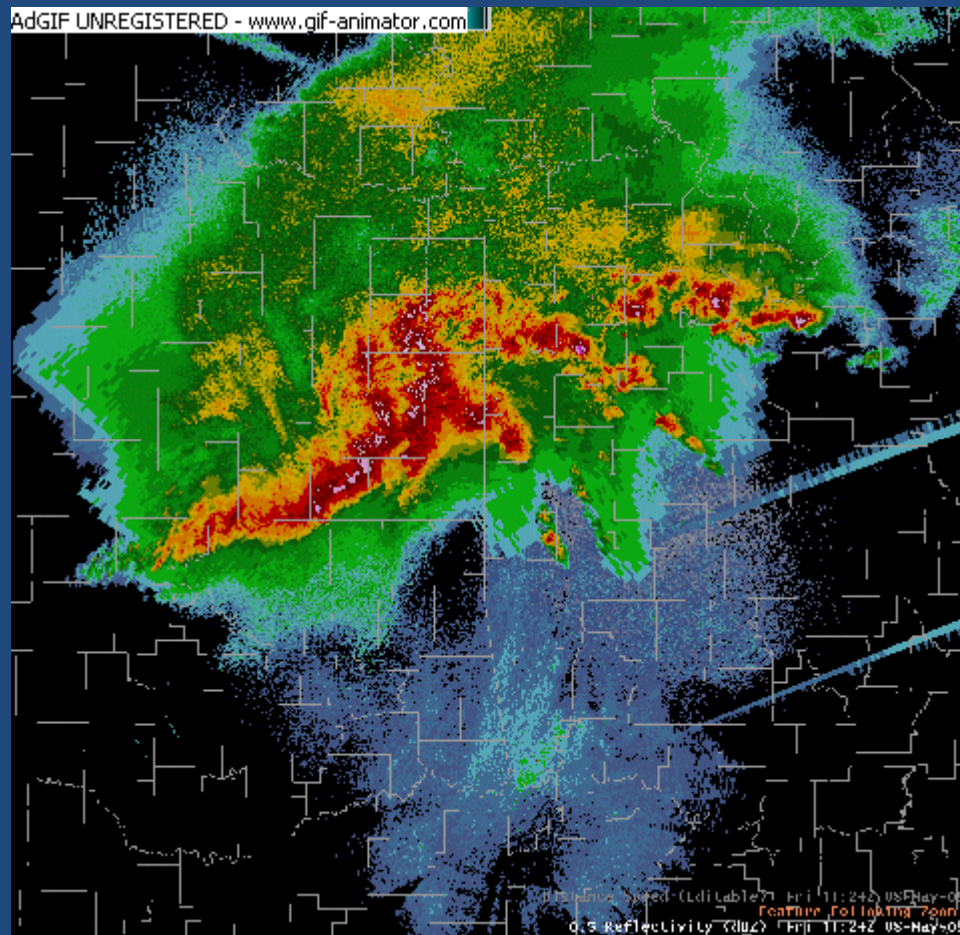
Trajectories

Courtesy of Morris Weisman



- Over time, the large northern vortex becomes a large, dominate circulation called a Mesoscale Convective Vortex

Storm-Relative Loop



Courtesy WDTB

Outflow Boundaries

- If they are relatively close to the radar, outflows from thunderstorms can be seen
- These boundaries, like all boundaries, contain energy which can be used to enhance thunderstorm severity and possibly aid in the production of tornadoes.

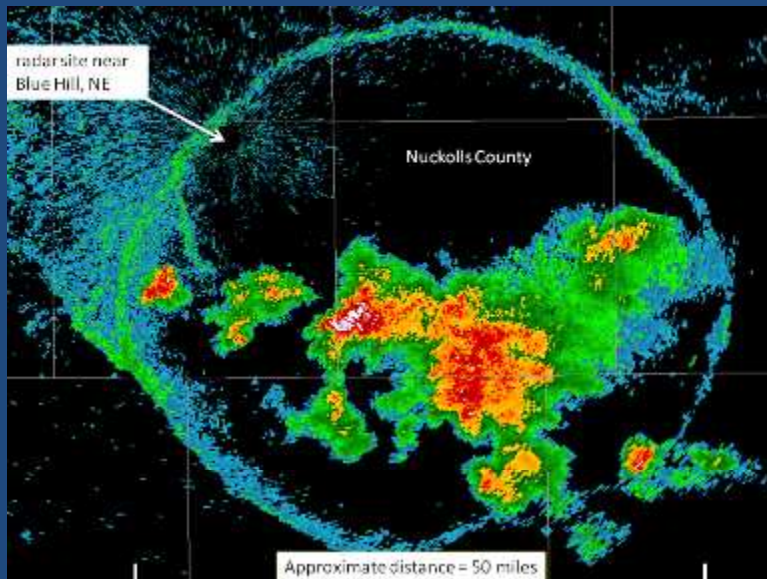
-70 10 -5+ 10 20 30 40 50 60 70
 VCP 1
 22.7 km
 111 52dBZ

LAPS Surface Wind SfcMns(kts) 07-03 0H Red 03:00Z 97
 LAPS Surface Wind(kts) 12-03 0H Red 03:00Z 97
 kpaoh 0.5 Refl 4bit Red 03:11Z 02 M -03 + kpaoh 0.5 SRM 8 Not 10

[illegible]

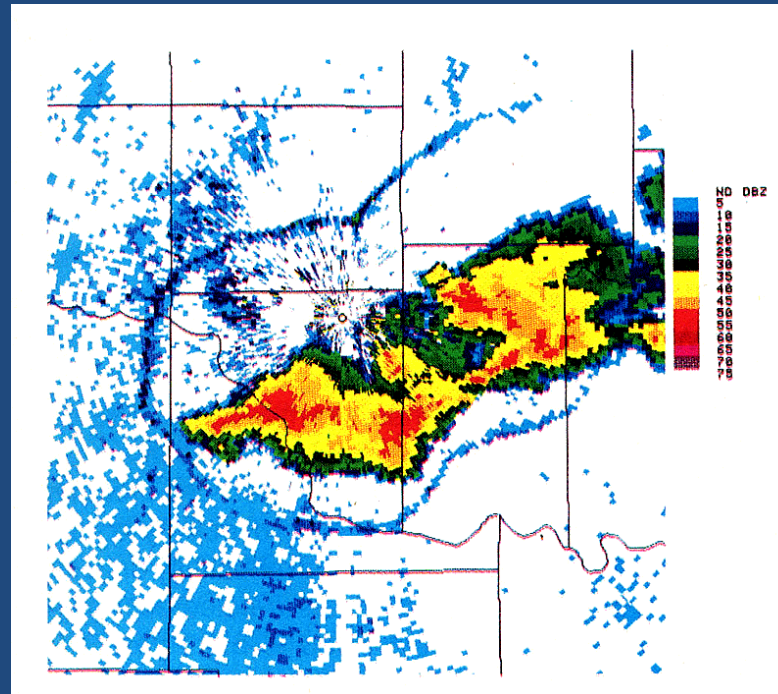
Can you find the outflow boundaries in this image?

Outflow Boundaries



crh.noaa.gov

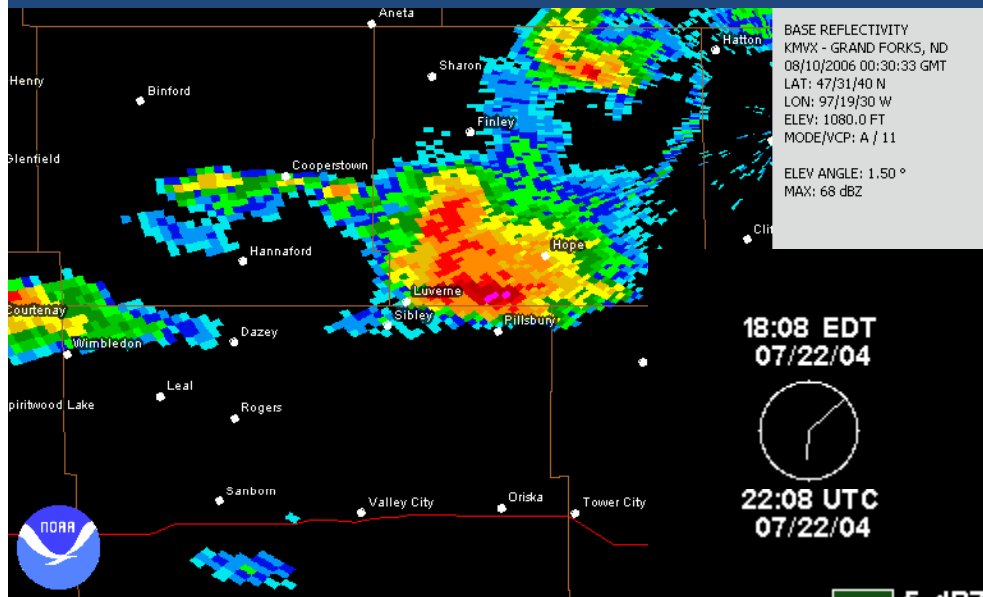
Some outflows aid in the development of new storms, others just signify the location of the edge of the air mass.



apollo.lsc.vsc.edu

Outflow Boundaries

Some outflows aid in the development of new storms, others just signify the location of the edge of the air mass.

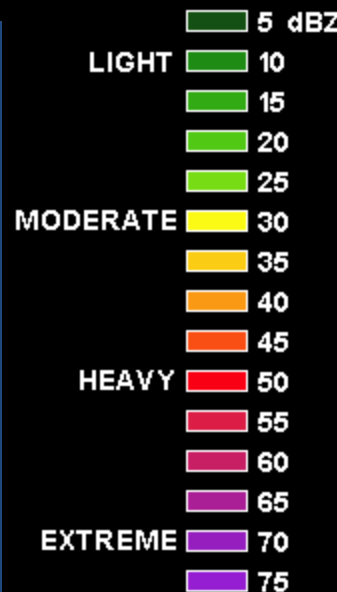


crh.noaa.gov

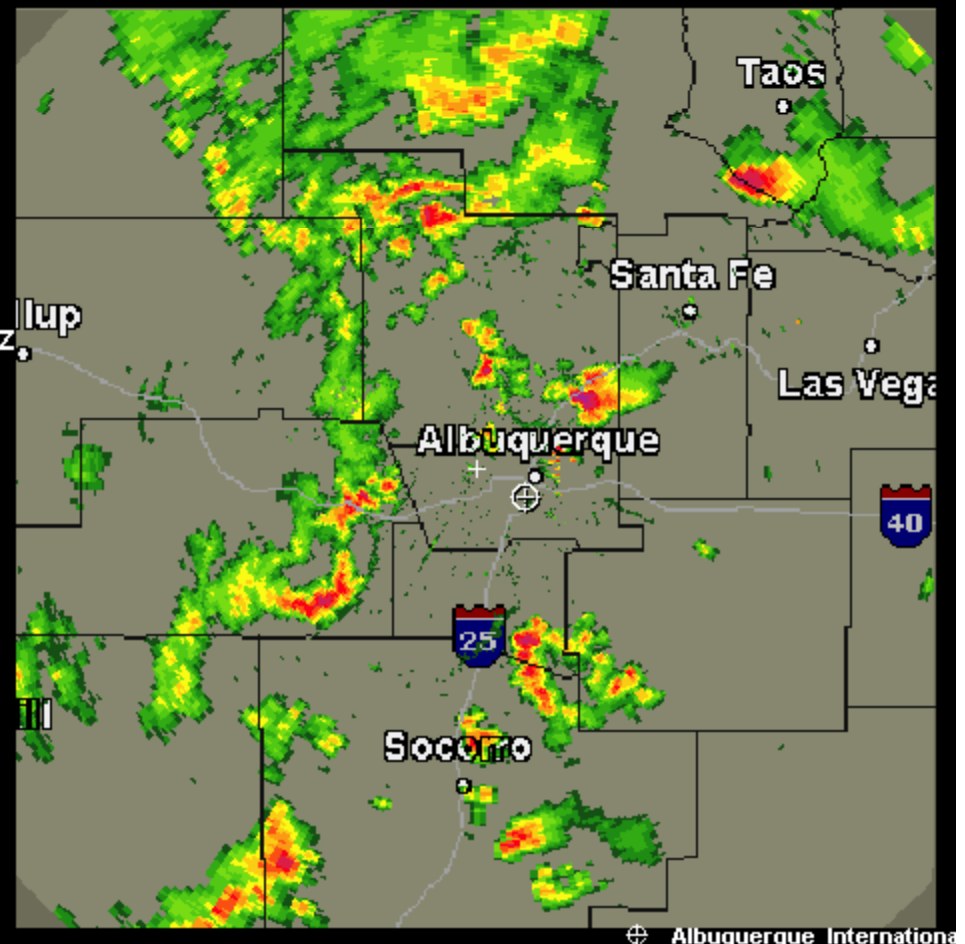
18:08 EDT
07/22/04



22:08 UTC
07/22/04



tima.homeip.net

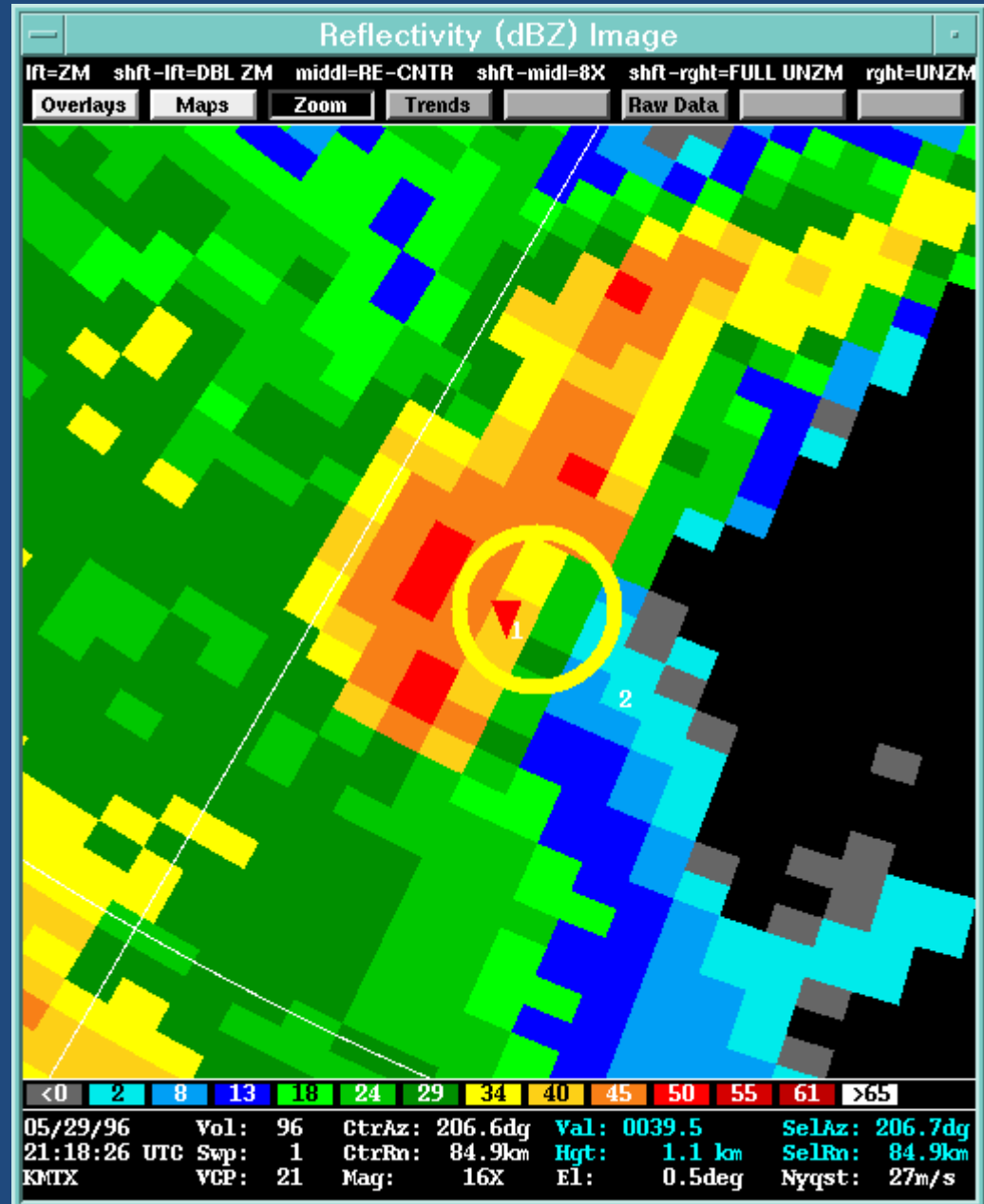


One Last Note: Algorithms (Computer Programs)

- There are algorithms within the radar and others developed on web sites that work to detect rotation, hail, etc.
- Very few of these take the atmosphere into account and are thus subject to simple yes/no logic.
- The atmosphere does not work that way...so be careful what the algorithms are telling you.



One Last Note: Algorithms (Computer Programs)



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THE END